KID LEARN

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Kid Learn

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ABSTRAK

Kajian ini bertujuan untuk menangani cabaran perkembangan perbendaharaan kata dalam kalangan kanak-kanak dan mencadangkan penyelesaian menggunakan teknologi. Perbendaharaan kata adalah penting untuk komunikasi yang berkesan dan pemerolehan maklumat, dan perkembangannya adalah penting, terutamanya dalam pembelajaran bahasa kedua. Satu cara yang berkesan untuk meningkatkan perkembangan perbendaharaan kata dalam kalangan kanak-kanak ialah dengan memasukkan teknologi ke dalam pengalaman pembelajaran mereka. Untuk menangani isu ini, kami mencadangkan aplikasi mudah alih baharu yang dipanggil Kid Learn dengan AR Visualisasi. Aplikasi ini direka untuk kanak-kanak berumur antara 3 dan 12 tahun, dan ia membolehkan mereka mempelajari perkataan perbendaharaan kata baharu melalui pengalaman bermain dan interaktif. Aplikasi ini termasuk teknologi realiti tambahan (AR), yang mempertingkatkan dunia sebenar dengan elemen visual digital, audio atau rangsangan deria lain, menjadikan pengalaman pembelajaran lebih menyeronokkan dan interaktif. Aplikasi ini akan menyediakan pengalaman pembelajaran yang dipertingkatkan AR di mana kanak-kanak boleh memilih daripada pelbagai kategori, dan objek akan dipaparkan pada skrin mudah alih mereka berdasarkan pilihan mereka. Aplikasi ini juga termasuk soalan kuiz dan permainan teka-teki untuk mengukuhkan ingatan kanak-kanak. Proses pembangunan aplikasi akan dipandu oleh metodologi pembangunan perisian Rapid Application Development (RAD), yang fleksibel dan membolehkan perubahan pantas semasa proses pembangunan. Pelaksanaan aplikasi ini diharapkan dapat menyediakan kanak-kanak dengan cara yang menyeronokkan dan interaktif untuk mempelajari perkataan perbendaharaan kata baharu, yang seterusnya akan meningkatkan kemahiran bahasa mereka dan meningkatkan pengalaman pendidikan mereka secara keseluruhan. Tambahan pula, memasukkan teknologi ke dalam pendidikan menjadi semakin penting dalam dunia hari ini, dan aplikasi ini selaras dengan trend ini. Kesimpulannya, aplikasi Kid Learn with AR Visualisasi ialah penyelesaian inovatif kepada cabaran pembangunan perbendaharaan kata dalam kalangan kanak-kanak dan mewakili satu bentuk pembelajaran baharu yang menggabungkan teknologi dengan cara yang menarik. Pembangunan aplikasi ini akan menyediakan kanak-kanak dengan cara yang menyeronokkan dan interaktif untuk mempelajari perkataan perbendaharaan kata baharu dan akan menyumbang kepada keseluruhan pengalaman pendidikan mereka.

ABSTRACT

The study aims to address the challenge of vocabulary development in children and propose a solution using technology. Vocabulary is essential for effective communication and information acquisition, and its development is crucial, especially in second language learning. One effective way to enhance vocabulary development in children is by incorporating technology into their learning experience. To address this issue, we propose a new mobile application called Kid Learn with AR Visualization. This application is designed for children between the ages of 3 and 12, and it allows them to learn new vocabulary words through play and interactive experiences. The application includes augmented reality (AR) technology, which enhances the real world with digital visual elements, audio, or other sensory stimuli, making the learning experience more fun and interactive. The application will provide an AR-enhanced learning experience where children can choose from a variety of categories, and objects will be displayed on their mobile screens based on their choices. The application also includes quiz questions and puzzle games to reinforce the children's memory. The development process of the application will be guided by the Rapid Application Development (RAD) software development methodology, which is flexible and allows for rapid changes during the development process. The implementation of this application is expected to provide children with a fun and interactive way to learn new vocabulary words, which will in turn enhance their language skills and improve their overall education experience. Furthermore, incorporating technology into education is becoming increasingly important in today's world, and this application is in line with this trend. In conclusion, the Kid Learn with AR Visualization application is an innovative solution to the challenge of vocabulary development in children and represents a new form of learning that incorporates technology in an engaging way. The development of this application will provide children with a fun and interactive way to learn new vocabulary words and will contribute to their overall educational experience.

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LIST OF ABBREVIATIONS

AR	Augmented Reality
SDM	Software Development Methodology
RAD	Rapid Application Development
DSDM	Dynamic Systems Development Method
XP	Extreme Programming
FDD	Feature-Driven Development
JAD	Joint Application Development
RUP	Rational Unified Process
ERD	Entity-Relationship Diagram
UAT	User Acceptance Test

CHAPTER 1

INTRODUCTION

1.1 Background

What exactly is vocabulary? Vocabulary is the words in a language or a specific group of words that you are learning (*Definition and Examples of Vocabulary*, 2019). Vocabulary is a collection of frequently used words in a person's language. Vocabulary is a valuable and essential medium of communication and information acquisition that improves with age. Developing a large vocabulary is one of the most challenging components of acquiring a second language.

One way to let the kid have fun while learning vocabulary is by using technology. According to Western Governors University (WGU) research, children can be confronted with a variety of media that can help their minds develop and help them learn things, including TV programmes and mobile applications. This is the most effective way for the child to easily memorise the new word. In addition, the majority of instructors have incorporated technology into the classroom to facilitate student learning. Teachers may use techniques to reach a wide range of students, reinforce and build on topics, and motivate students in interesting ways. As more instructors use technology, new sorts of learning may occur in classrooms, and more kids could be targeted in ways they can comprehend. (*Impact of Technology on Kids Today and Tomorrow.*, 2019)

In this project, a mobile application called Kid Learn with AR visualisation will be proposed to children aged 3 to 12 years old to allow them to play while learning a new word. This Kid Learn with AR Visualization mobile application will include augmented reality (AR). Augmented reality (AR) is a digitally enhanced depiction of the real world that is generated using digital visual elements, audio, or other sensory stimuli. It is an emerging trend among companies that deal with mobile computing and commercial

applications. (*Augmented Reality (AR) Definition*, 2020) This mobile application included an AR technique because AR can make learning new words more fun and interactive for children. Because some words require technology to be shown to children, AR can also assist parents and teachers in explaining them. AR is the best way to let the kid learn the new word. In this Kid Learn with AR Visualization mobile application, the kid can choose any category based on the mobile app's preparation. After the kid chooses any category, their mobile's camera will open, and the object will display on the mobile screen based on the category the kid chose. At the same time, the kid can also learn the word because he can do the quiz prepared on the application, and this app also provides puzzle games to train the kid's memory.

1.2 Problem Statement

With the widespread availability of smart gadgets that can connect to the Internet on a global scale, a new era of education has arrived, regardless of when or where it occurs. The traditional education system is a bit boring and makes it hard to stimulate kids' interest in learning. This is because the traditional education material only has theory and a diagram to show the kid. In Malaysia, which still uses one-way education, if the kid does not understand the answer, some of the kids are shy about asking back to the teacher. So, the kid's learning progress will be affected. (*Benefits of Technology in the Classroom - TeachHUB*, 2019) Many mobile applications are being developed today, but none of them use the AR technique.

The traditional games are also a bit boring and cannot be played anytime, anywhere. For example, if a kid loses a piece of the puzzle, the puzzle cannot be completed. This is one of the disadvantages of the traditional game. The traditional quiz is also difficult to let the child do at any time or place. For example, if parents want to test their kid's understanding of a word, they must prepare the writing material, such as pencil and paper, anytime, anywhere.

1.3 Objectives

The objectives of this project are as the following:

I. To develop a creative study material for kids using the AR technique.

II. To develop a creative game to train the kid’s memories.

III. To develop a quiz to test the kid's understanding.

1.4 Scope

The project’s scope is listed as follows:

I. This application is designed for children over the age of four.

II. The application is only Android-based.

III. This application is in the English language.

IV. This application will add the Augmented Reality (AR) technique.

1.5 Report Organization

In this thesis, which consists of 5 chapters, Chapter 1 discusses the background of the thesis, the problem statement, the objective, the scope of this project, and the report organization.

Chapter 2 provides a literature evaluation of the application as well as a listing of the existing system, a comparison of the existing system, and so on.

Chapter 3 presents the methodology used in the project. All the use case diagrams, flowcharts, and proposed designs will be included in this chapter. Besides that, this chapter will also explain all the hardware and software requirements required for project development. Next, in this chapter, you can also find the Gantt charts.

Chapter 4 will present the implementation and results of this project. The project implementation will be explained together with the user manual. At the same time, the result of the User Acceptance Test (UAT) will be documented in this chapter.

Chapter 5, which is the last chapter, will summarise the project's development by revisiting the objective. At the same time, it will explain the limitations of the applications and the work that can be done to improve them in the future.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will present the three existing mobile applications related to the project. Besides that, this chapter will compare the system functions of three existing mobile applications that have been chosen.

2.2 Existing System

There are three existing systems related to the project, such as Edudadoo, Chick-Learn English, and English for Kids. These three applications have different functions that can be compared.

2.2.1 Edudadoo

Figure 2.2.1: Edudadoo Logo

Adam Vlek invented Edudadoo. Edudadoo is a hand-drawn world inhabited by Edzees, friendly and colorful-eared animals with a plethora of educational activities, graphics, and sounds for children to learn and hone their skills. Edudadoo offers a platform for both mobile applications and iOS and Android devices. Edudadoo created this environment for the kids to engage with technology in meaningful ways, whether it is colouring their favourite toys, blowing virtual bubbles, learning new sounds, or practising their memory.

Figure 2.2.2: Home Page of Edudadoo

On this platform, the kid can choose the left-hand side or the right-hand side. The left-hand side is the type of game mode, and the right-hand side is the categories of vocabulary. After the kid finishes choosing, they can click the middle button, and then they can start learning and playing the games. If the parents want to make more of an effort to use this app, they can click below the button and then create their own vocabulary album. The advantages of this application are not included in the advertisement. The disadvantages of this application are that the free version can only create one album and three images.

2.2.2 Chick - Learn English

Figure 2.2.3: Chick – Learn English Logo

Chick—Learn English, created by Enes Aydin Chick—Learn English is an educational app that can help children improve their vocabulary by playing games and making them fun. Chick: Learning English can also help the kid's visual, auditory, and reading development. Chick—Learn English offers a platform via mobile applications for both Android and iOS devices. This application has 500 words with images and audio to study vocabulary. This application also has 16 different categories of vocabulary and prepares some games for kids.

Figure 2.2.4: Home Page of Chick – Learn English

On this platform, the kid can choose one category and then start learning and playing the game. The disadvantages of this application are included in the advertisement.

2.2.3 English For Kids

Figure 2.2.5: English For Kids

Miracle FunBox created English for Kids. English for Kids is a useful tool for helping children enhance their English vocabulary, listening, and reading abilities. English for Kids offers a variety of activities, such as listening, spelling, reading, ABC games for kids, word games for kids, and matching quizzes for toddlers and children, to help children learn English with a diverse vocabulary. English for Kids is only supported by the Android mobile application. This application may assist parents and children in acquiring vocabulary in the most efficient manner. This application provides a basic and straightforward learning game for children that is both fascinating and gratifying.

Figure 2.2.6: Home Page of English For Kids

On this platform, the kid can choose any level of vocabulary, and then the kid can start learning and playing the game. The kid can also click on the profile and change the avatars and insert a nickname. The disadvantages of this application are included in the advertisement.

2.3 Comparative Analysis

Below the Table 2.1 shows the comparison of three existing system features and the Table 2.2 shows advantage and disadvantage between of three existing system.

Applications Specification	Edudadoo	Chick – Learn English	English For Kids
AR Technique in application	No	No	No
Function	A platform to let the kids learn while playing the game and memorising the vocabulary.	A platform to let the kids learn while playing the game and memorising the vocabulary.	A platform to let the kids learn while playing the game and memorising the vocabulary.
Features	- Skill-building games for the kids, such as recording, reading, and colouring, - Categories of vocabulary album for kids. - Parents can add they own album to let the application more vocabulary album.	- 500 words with images and audio to study vocabulary. - 16 different categories of vocabulary. - 5 different type of game. - Provide a support system to let the parents make a comment.	- ABC Course, let the kid learn letters from A to Z and a lot of ABC games prepared for kid. - Vocabulary Course, a lot of lessons and levels to help the kids learn the English vocabulary easily and word game was prepared for kid. - Number Course, in this course the kid can learn numbers and basic math and prepared some interest counting activities.

			- Provide the lifetime and daily leaderboard. - Can choose any avatar provided as profile picture.
Hardware	Smartphone	Smartphone	Smartphone
Platform and Deployment	- Android - IOS	- Android - IOS	- Android
User	- Parent - Ages up to 5 years old kid	- Parent - 2 to 8 years old kid	- Parent - Ages up to 5 years old kid
Advertisement	No	No	No
Language	English and Czech	English	English, Arabic, French, Indonesian, Italian, Russian, Spanish, Japanese, Korean, German, Polish, Malay, Thai, Portuguese (Brazilian), Turkish, Vietnamese.
Cost of subscription	RM 33.99	RM 21.99	RM 14.99
Size of Application	79 MB	19 MB	37 MB

Table 2.1: Table of comparison of three existing system features

Application	Advantages	Disadvantages
Edudadoo	1. This application did not include advertisement.	1. This application need subscription to get the full version.

	2. This application is simple and easy to kid use.	2. Payment method only support Google Play account.
	3. This application prepared a lot of game to improve kid vocabulary.	
Chick – Learn English	1. This application is simple and easy to kid use.	1. This application include advertisement. If the user need remove the advertisement, they need subscription this application.
	2. This application prepared a lot of game to improve kid vocabulary.	2. Payment method only support Google Play account.
English For Kids	1. This application is simple and easy to kid use.	1. This application include advertisement. If the user need remove the advertisement, they need subscription this application.
	2. This application prepared a lot of game to improve kid vocabulary.	2. Payment method only support Google Play account.

Table 2.2: Table of Advantage and Disadvantage between of three existing system

2.4 Chapter Summary

In this chapter, compare between three existing system. Based on the discussion, it clear that each existing system has its own set of advantages and disadvantages. Simultaneously, some of the current system's features will be implemented in the suggested application.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discusses the methodology that will be used in developing the Kid Learn with AR Visualization mobile application. Software development methodology (SDM) refers to the systematic methods that are used when working on a project. It is required for project development since it can get the most out of one depending on the team structure, objectives, and goals. There are many SDMs that are available for project development, such as Agile, DevOps, Waterfall, Spiral, Rapid Application Development (RAD), Dynamic Systems Development Method (DSDM), Prototype, Extreme Programming (XP), Feature-Driven Development (FDD), Joint Application Development (JAD), and Rational Unified Process (RUP). However, each methodology will approach system development in a unique way. (*The Benefits of Adhering to a Software Development Methodology,* 2015)

In this project, RAD will be used to develop the Kid Learn mobile application because it is flexible. The developer may make changes rapidly during the development process and deliver rapid progress in a short period of time. RAD has four primary phases: requirements planning, user design, construction, and cutover. Each phase will be explained in detail. In addition, this chapter also describes the hardware and software used in the creation of this project.

3.2 Software Ddevelopment Methodology

Rapid application development (RAD) is a prevalent agile project management strategy in software development. RAD is advantageous because it enables developers to operate in a fast-paced environment, such as application development. RAD's focus on

removing the planning phase and prioritising prototype development enables this rapid turnaround. RAD enables developers and users to accurately measure performance and interact in real time about developing issues or modifications.(*Top 4 Software Development Methodologies | Synopsys*, 2017)

Rapid Application Development (RAD) comprises the steps of requirements planning, user design, construction, and cutover. The steps of user construction and operation are performed until the user is comfortable that the final product meets all requirements. Below Figure 3.2.1, each phase's activities and behaviours will be distinct.

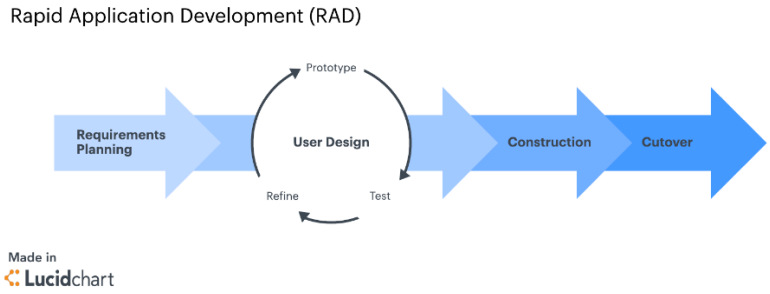


Figure 3.2.1: Rapid Application Development Life Cycle

3.2.1 Requirements Planning

Comparable to the project's scope debate is requirements planning. Throughout this phase, developers and users will work together to establish the project's purpose and goals, including the current and prospective obstacles that must be addressed during development. The specifications comprised expectations, a budget, deadlines, and objectives. The users may also offer developers their vision as necessary to realise that goal. This activity can help avoid misunderstandings that may occur after the system has been established.

The purpose of developing the Kid Learn with AR Visualization mobile application is to allow the kid to learn the new vocabulary in an interesting way, such as by playing puzzle games. All kids above 4 years old can use this mobile application to learn words. User Design

After the user has determined the project requirements, the developer will go forward with the user design, which is a continual process. The developers and the client

collaborate in an iterative process to create a prototype, test it, and analyse its achievements and shortcomings. They will continue in this cyclical process until they have reached a satisfactory level of refinement.

3.2.2 Construction

After the design process is complete, the developer will start to transform the design into a prototype. This step may be performed as often as necessary to accommodate new components and modifications. To move the work forward in a timely manner, teams frequently use reduced or fast application development tools.

In this project, Android Studio will be used to develop the Kid Learn with AR Visualization mobile application, and the data storage will be done using Firebase. All application development will be based on the previously finalised design and specifications. At the end of development, the developer and client will test all of the application component's functionality to ensure that there are no bugs or errors in the system and that the user's expectations can be met.

3.2.3 Cutover

The final stage in RAD is the cutover phase, where the Kid Learn with AR Visualization Mobile Application is ready to be delivered to the user. This is the implementation phase, in which the application is finalised and prepared for launch. Before the programme is deployed, the last adjustments are made between the developer and the customer.

3.3 Functional and Non-Functional Requirement

Functional Requirement	Non-Functional Requirement
The system should allow users to choose and view the category based on what they selected in this application.	The system should prepare an easy function because kids can easily use this application.
The system should allow users to use their phone's camera function to view the AR.	The system should be available within 24 hours because it does not affect the user experience in this application.
The system should allow users to choose, view, and play the puzzle based on what they selected in this application.	The system should allow users to use the application without any guidelines or manuals.
The system should allow users to choose, view, and play the quiz based on what they selected in this application.	The system should be secure to prevent user privacy leakage.

Table 3.1: Table of Functional and Non-Functional Requirement for Kid Learn mobile application

3.4 Constraints

Kid-learning mobile applications with AR applications are still relatively unknown in this market. AR can also increase kids' interest in learning.

3.5 Limitations

Unable to support IOS devices. The web cannot also support this application.

3.6 Context Diagram

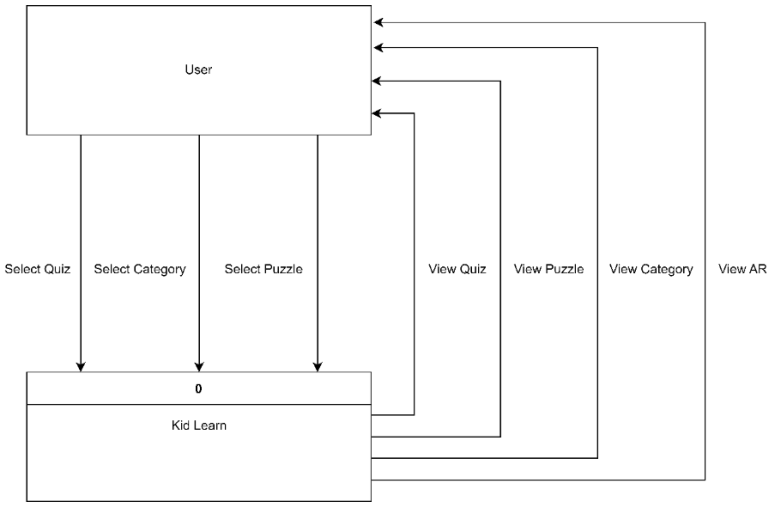


Figure 3.6.1: Context Diagram of Kid Learn mobile application

The context diagram above shows the user can select the category, quiz, or puzzle. After the user selects the category, they will proceed to the category page. Aside from that, the user can select the puzzle, which will take them to the puzzle page, where they can begin playing the puzzle. Furthermore, the user can select the quiz, and the user can proceed to the quiz page and start taking the quiz. The user can also view the AR after selecting the category.(*What Is a Context Diagram (and How Can You Create One)? - Venngage*, 2022).

3.7 Use Case Diagram

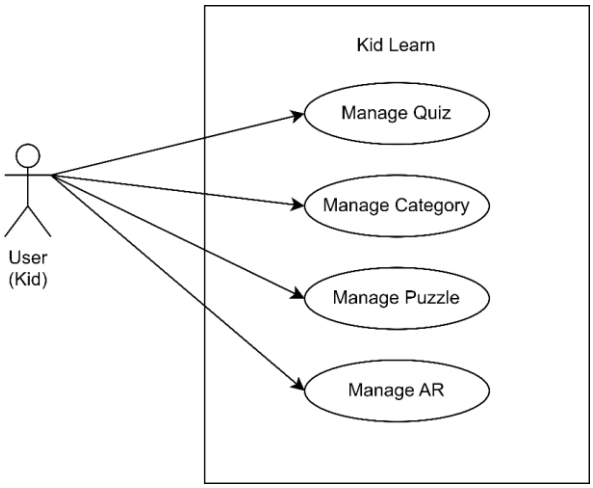


Figure 3.7.1: Use Case Diagram

Figure 3.7.1 shows the use-case diagram and explains the user-system interaction. This application will only have one type of user: a child. First, users are able to access

this, and then they may start to enjoy using the application. After the user has accessed the system, they will see the categories. They can select any option from the category. After they choose, the application will bring them to a specific page. Users can select any puzzle prepared on this mobile application and start playing the puzzle. The user can also view the AR object after selecting the category.(*UML Use Case Diagram: Tutorial with EXAMPLE*, 2022)

3.8 Flowchart

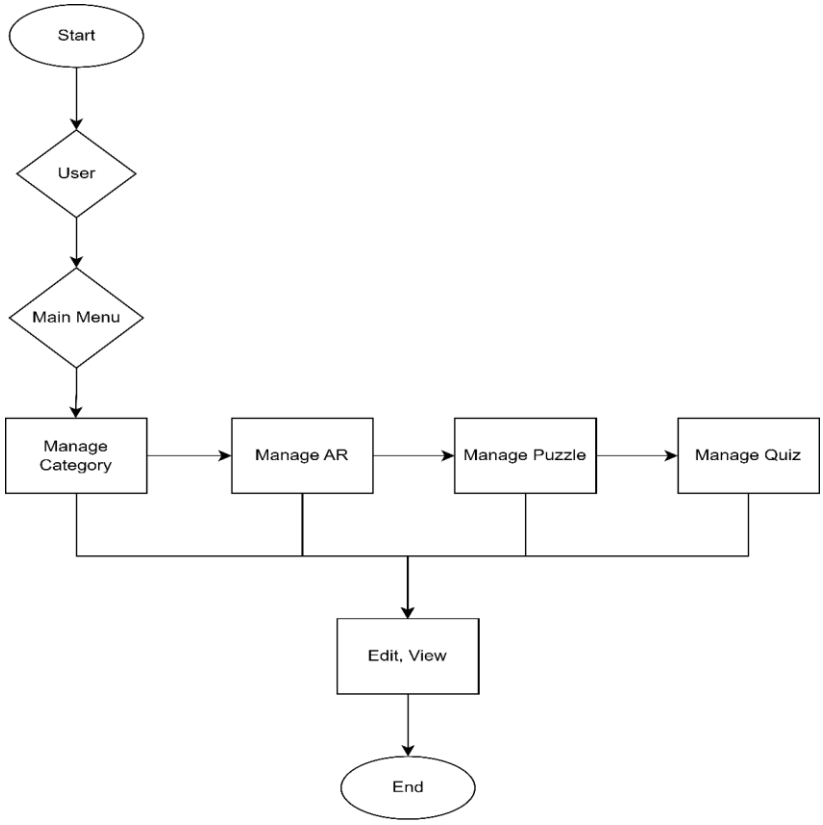


Figure 3.8.1: Flowchart

Figure 3.8.1 shows the flowchart of the Kid Learn mobile application. When the user starts the application, the application will display the homepage, and then the user can start managing categories, such as choosing any category and viewing the categories that are prepared. After the user selects the category, they will proceed to the AR page, where they can manage the AR object, such as edit it or view it. Besides that, the user can manage the puzzle by selecting it and starting to play it. Furthermore, the user can manage the quiz by selecting the quiz based on the category and beginning to take the quiz once it is ready. (*What Is a Flowchart? Symbols, Types, and How To Read It • Asana*, 2021)

3.9 Activity Diagram

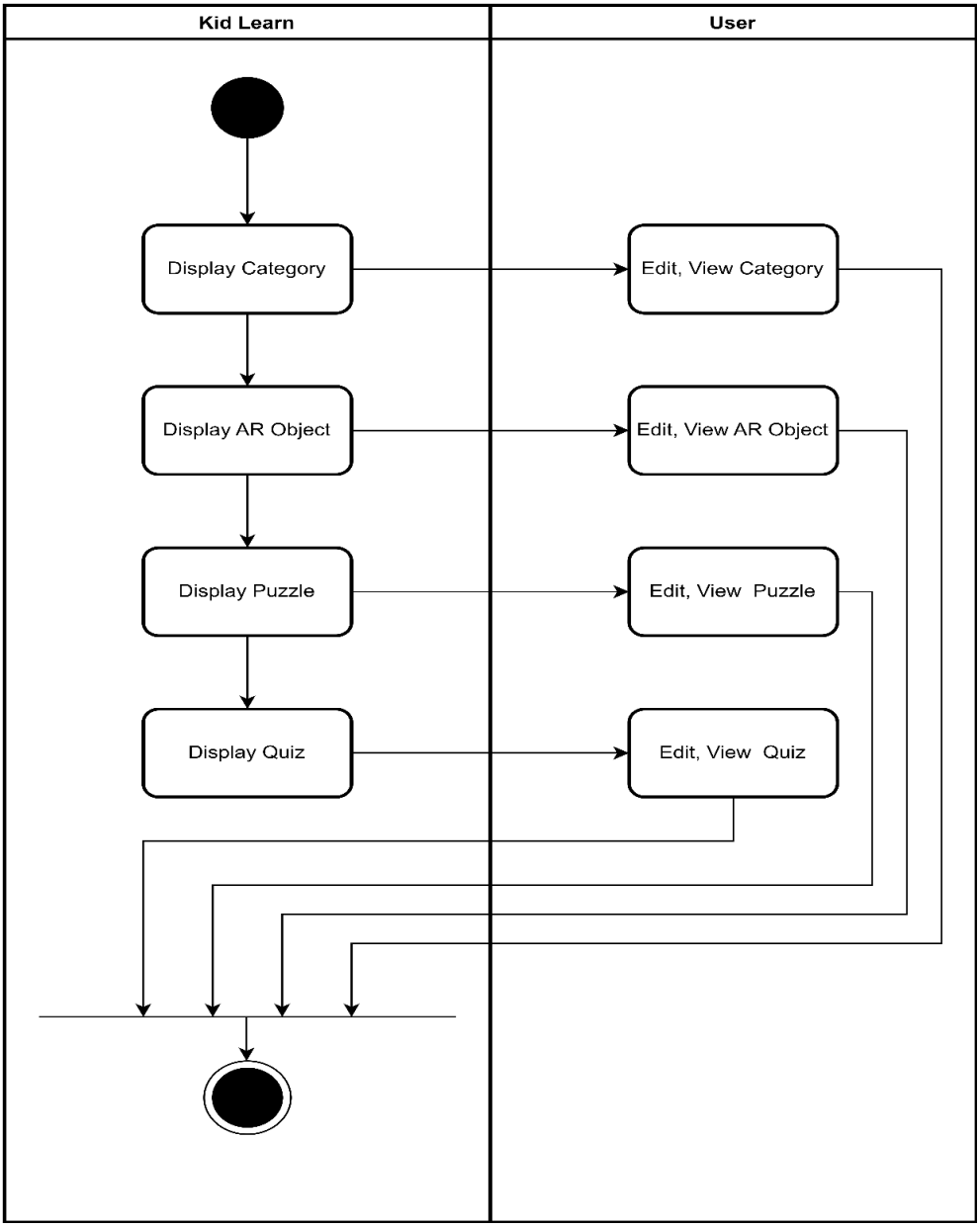


Figure 3.9.1: Activity Diagram of Kid Learn mobile application

In figure 3.9.1, the Kid Learn mobile application will display the category, AR object, puzzle, and quiz. The user can also view and edit the categories, AR objects, puzzles, and quizzes.

3.10 Entity-Relationship Diagram

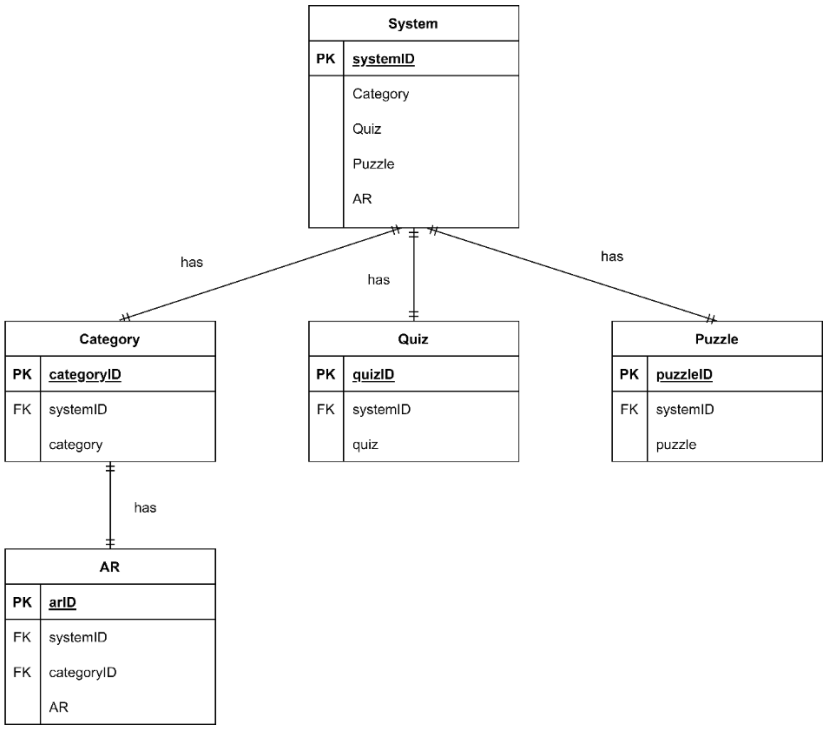


Figure 3.10.1: Entity-Relationship Diagram of Kid Learn mobile application

Figure 3.10.1 shows there are five entities in this project. The system table stores all the elements such as category, quiz, puzzle, and AR. The category table stores the category of the vocabulary, the quiz table stores the quiz question, the puzzle table stores all the puzzle pictures, and the AR table stores the AR object based on the category. (*Entity Relationship Diagram (ERD) - What Is an ER Diagram?*, 2006).

3.11 Data Model

3.11.1 Table Category

Field Name	Description	Data Type	Constraint
categoryID	Category ID	INT	PK, NOT NULL
systemID	System ID	INT	FK, NOT NULL

Category	Category	VARCHAR (50)	NOT NULL

Table 3.2: Table Category for Kid Learn mobile application

3.11.2 Table Quiz

Field Name	Description	Data Type	Constraint
quizID	Quiz ID	INT	PK, NOT NULL
systemID	System ID	INT	FK, NOT NULL
Quiz	Quiz	VARCHAR (50)	NOT NULL

Table 3.3: Table Quiz for Kid Learn mobile application

3.11.3 Table Puzzle

Field Name	Description	Data Type	Constraint
puzzleID	Puzzle ID	INT	PK, NOT NULL
systemID	System ID	INT	FK, NOT NULL
Puzzle	Puzzle	IMG	NOT NULL

Table 3.4: Table Puzzle for Kid Learn mobile application

3.11.4 Table System

Field Name	Description	Data Type	Constraint

systemID	System ID	INT	PK, NOT NULL
Category	Category	VARCHAR (50)	NOT NULL
Quiz	Quiz	VARCHAR (50)	NOT NULL
Puzzle	Puzzle	IMG	NOT NULL
AR	AR Object	OBJ	NOT NULL

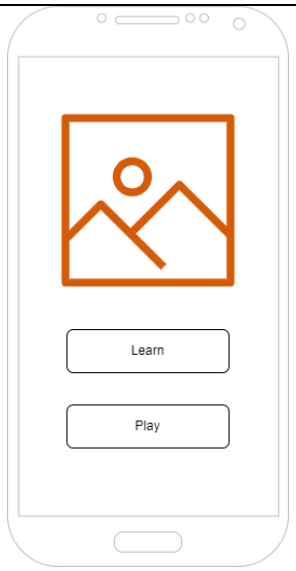
Table 3.5: Table System for Kid Learn mobile application

3.11.5 Table AR

Field Name	Description	Data Type	Constraint
arID	AR ID	INT	PK, NOT NULL
categoryID	Category ID	INT	FK, NOT NULL
systemID	System ID	INT	FK, NOT NULL
AR	AR Object	OBJ	NOT NULL

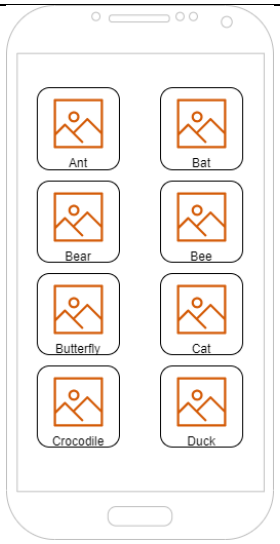
Table 3.6: Table AR for Kid Learn mobile application

3.12 Storyboard

<table>
<tr><td>FRAME 1</td><td>SCENE: Home Page</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Interface</td></tr>
<tr><td>Interface</td><td>2D</td></tr>
<tr><td>Texts</td><td>Helvetica</td></tr>
<tr><td>Button</td><td>Learn Button, Play Button</td></tr>
<tr><td>Sound</td><td>Button Sound</td></tr>
<tr><td>Music</td><td>-</td></tr>
<tr><td>Previous Scene</td><td>-</td></tr>
<tr><td colspan="2">Remarks</td></tr>
<tr><td colspan="2">1. This is home page for this application.
2. The home page will put two buttons.
3. User can select learn button or play button go to the next page.</td></tr>
</table>

FRAME 2	SCENE: Learn Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Animal Image Button, Ball Image Button, Food Image Button, Fruit Image Button, Home Image Button, Playground Image Button, School Image Button, Tool Image Button, Vegetable Image Button, and Vehicle Image Button
Sound	-
Music	-
Previous Scene	Home Page
Remarks	
1. This is the learn page scene for this application.	

2. The learn page will put ten category image buttons. 3. User can select the category go to next page.

FRAME 3	SCENE: Animal Learn Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Ant Image Button, Bat Image Button, Bear Image Button, Bee Image Button, Butterfly Image Button, Cat Image Button, Crocodile Image Button, Duck Image Button, Dog Image Button, Elephant Image Button, Fox Image Button, Fish Image Button, Goat Image Button, Gorilla Image Button, Giraffe Image Button, Horse Image Button, Kangaroo Image Button, Kiwi Image Button, Lion Image Button, Monkey Image Button, Mouse Image Button, Octopus Image Button, Panda Image Button, Penguin Image Button, Rabbit Image Button, Rhino Image Button, Scorpion Image Button, Spider Image Button, Snake Image

	Button, Tiger Image Button, Turtle Image Button, Whale Image Button, Wolf Image Button, and Zebra Image Button.
Sound	-
Music	-
Previous Scene	Learn Page
Remarks	
1. This is the animal learn page scene for this application. 2. The animal learn page will put 34 image buttons shown above. 3. User can select the animal go to the AR page.	

FRAME 4	SCENE: Ball Learn Page
	
Interface	
Interface	2D

Texts	Helvetica
Button	Basketball Image Button, Baseball Image Button, Bowling Image Button, Cricket Image Button, Football Image Button, Golf Image Button, Rugby Image Button, Ping Pong Image Button, Pool Image Button, Shuttlecock Image Button, Volleyball Image Button and Tennis Image Button
Sound	-
Music	-
Previous Scene	Learn Page
Remarks	
1. This is the ball learn page scene for this application. 2. The ball learn page will put 12 image buttons shown above. 3. User can select the ball go to the AR page.	

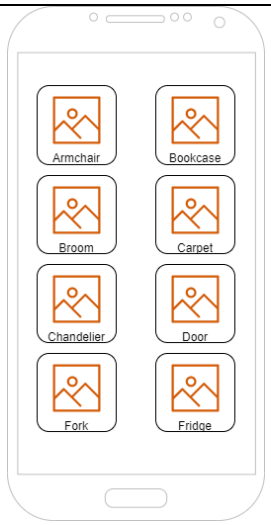
FRAME 5	SCENE: Food Learn Page

Interface	
Interface	2D
Texts	Helvetica
Button	Bacon Image Button, Bread Image Button, Butter Image Button, Cake Image Button, Cheese Image Button, Donut Image Button, Egg Image Button, French Fries Image Button, Ham Image Button, Hamburger Image Button, Hot Dog Image Button, Ice Cream Image Button, Pie Image Button, Pizza Image Button, Roast Chicken Image Button, Kebab Image Button, Salad Image Button, Sandwich Image Button, Steak Image Button and Waffle Image Button.
Sound	-
Music	-
Previous Scene	Learn Page
Remarks	

1. This is the food learn page scene for this application. 2. The food learn page will put 20 image buttons shown above. 3. User can select the food go to the AR page.

FRAME 6	SCENE: Fruit Learn Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Apple Image Button, Avocado Image Button, Banana Image Button, Blueberry Image Button, Cherry Image Button, Coconut Image Button, Dragon Fruit Image Button, Fig Image Button, Grape Image Button, Kiwi Image Button, Lemon Image Button, Lime Image Button, Lychee Image Button, Mango Image Button, Melon Image Button, Orange Image Button, Papaya Image Button, Peach Image Button, Pear Image Button, Pineapple Image Button, Strawberry Image Button, and Watermelon Image Button

Sound	-
Music	-
Previous Scene	Learn Page
Remarks	
1. This is the fruit learn page scene for this application. 2. The fruit learn page will put 22 image buttons shown above. 3. User can select the fruit go to the AR page.	

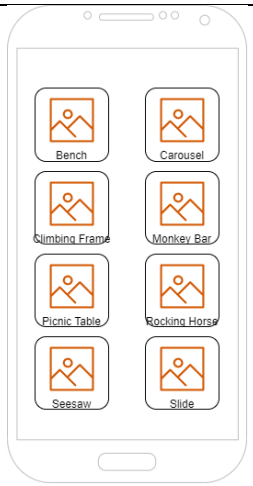
FRAME 7	SCENE: Home Learn Page
	
Interface	
Interface	2D
Texts	Helvetica

Button	Armchair Image Button, Bookcase Image Button, Broom Image Button, Carpet Image Button, Chandelier Image Button, Door Image Button, Fork Image Button, Fridge Image Button, Glass Image Button, Guitar Image Button, Hair Dryer Image Button, Hager Image Button, Kettle Image Button, Lamp Image Button, Microwave Image Button, Piano Image Button, Rice Cooker Image Button, Sofa Image Button, Spoon Image Button, Television Image Button, Toaster Image Button, and Vacuum Image Button.
Sound	-
Music	-
Previous Scene	Learn Page

Remarks

1. This is the home learn page scene for this application.
2. The home learn page will put 22 image buttons shown above.
3. User can select the home go to the AR page.

FRAME 8	SCENE: Playground Learn Page

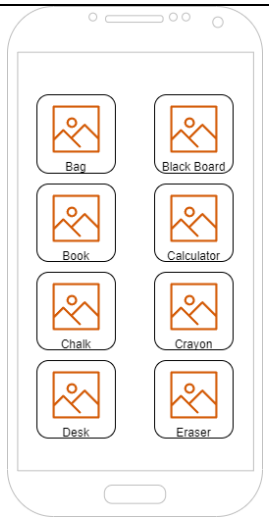


Interface	
Interface	2D
Texts	Helvetica
Button	Bench Image Button, Carousel Image Button, Climbing Frame Image Button, Monkey Bar Image Button, Picnic Table Image Button, Rocking Horse Image Button, Seesaw Image Button, Slide Image Button, Swing Image Button, Spring Rider Image Button, Sandpit Image Button, and Trampoline Image Button
Sound	-
Music	-
Previous Scene	Learn Page

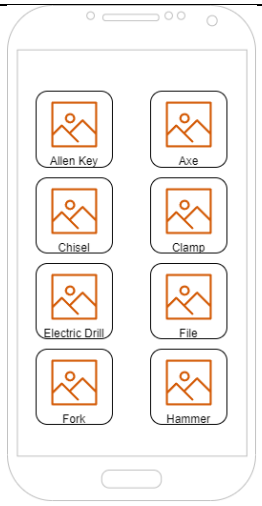
Remarks

1. This is the playground learn page scene for this application.
2. The playground learn page will put 12 image buttons shown above.

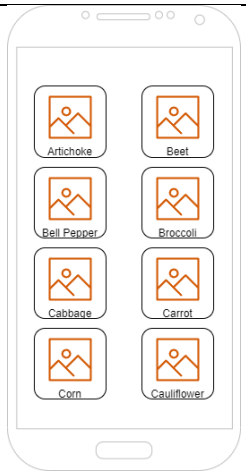
3. User can select the playground go to the AR page

FRAME 9	SCENE: School Learn Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Bag Image Button, Black Board Image Button, Book Image Button, Calculator Image Button, Chalk Image Button, Crayon Image Button, Desk Image Button, Eraser Image Button, Folder Image Button, Globe Image Button, Highlighter Image Button, Paper Image Button, Pen Image Button, Pencil Image Button, Pencil Case Image Button, Ruler Image Button, Sharpener Image Button, White Board Image Button
Sound	-
Music	-

Previous Scene	Learn Page
Remarks	
1. This is the school learn page scene for this application. 2. The school learn page will put 20 image buttons shown above. 3. User can select the school go to the AR page	

FRAME 10	SCENE: Tool Learn Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Allen Key Image Button, Axe Image Button, Chisel Image Button, Clamp Image Button, Electric Drill Image Button, File Image Button, Fork Image Button, Hammer Image Button, Mallet Image Button, Pocket Knife Image Button, Pliers Image Button,

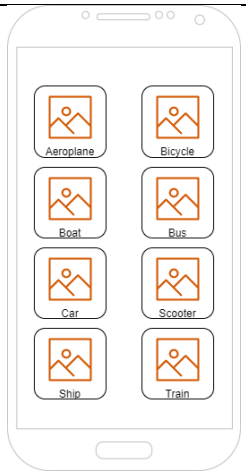
	Saw Image Button, Screwdriver Image Button, Scissor Image Button, Spanner Image Button, Wrench Image Button
Sound	-
Music	-
Previous Scene	Learn Page
Remarks	
1. This is the tool learn page scene for this application. 2. The tool learn page will put 16 image buttons shown above. 3. User can select the tool go to the AR page	

FRAME 11	SCENE: Vegetable Learn Page
	
Interface	
Interface	2D

Texts	Helvetica
Button	Artichoke Image Button, Beet Image Button, Bell Pepper Image Button, Broccoli Image Button, Cabbage Image Button, Carrot Image Button, Corn Image Button, Cauliflower Image Button, Cucumber Image Button, Mushroom Image Button, Onion Image Button, Potato Image Button, Pumpkin Image Button, Radish Image Button, Sweet Potato Image Button, Tomato Image Button
Sound	-
Music	-
Previous Scene	Learn Page

Remarks
1. This is the vegetable learn page scene for this application. 2. The vegetable learn page will put 16 image buttons shown above. 3. User can select the tool go to the AR page

FRAME 12	SCENE: Vehicle Learn Page



Interface	
Interface	2D
Texts	Helvetica
Button	Aeroplane Image Button, Bicycle Image Button, Boat Image Button, Bus Image Button, Car Image Button, Scooter Image Button, Ship Image Button, Train Image Button, Truck Image Button, Helicopter Image Button, Motorcycle Image Button, Ambulance Image Button, Van Image Button, Fire Engine Image Button, Forklift Image Button, Race Car Image Button
Sound	-
Music	-
Previous Scene	Learn Page

Remarks

1. This is the vehicle learn page scene for this application.
2. The vehicle learn page will put 16 image buttons shown above.

3. User can select the vehicle go to the AR page

FRAME 13	SCENE: AR Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	-
Sound	-
Music	-
Previous Scene	Animal Learn Page, Ball Learn Page, Food Learn Page, Fruit Learn Page, Home Learn Page, Playground Learn Page, School Learn Page, Tool Learn Page, Vegetable Learn Page, Vehicle Learn Page
Remarks	

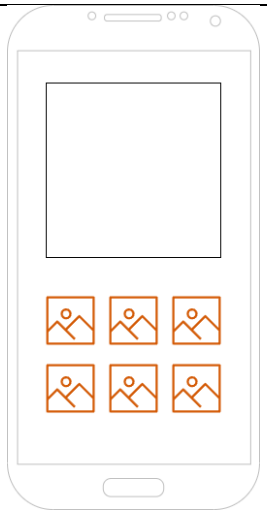
1. This is the AR page scene for this application. 2. All learn page can access this AR Page. 3. This scene will display the virtual object on this mobile application.

FRAME 14	SCENE: Play Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Puzzle Button, Quiz Button
Sound	-
Music	-
Previous Scene	Home Page
Remarks	

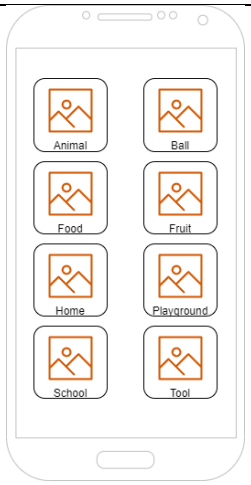
1. This is the play page scene for this application. 2. The play page will put two buttons. 3. User can select puzzle button or quiz button go to the next page.

FRAME 15	SCENE: Puzzle Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Image Button
Sound	-
Music	-
Previous Scene	Play Page
Remarks	

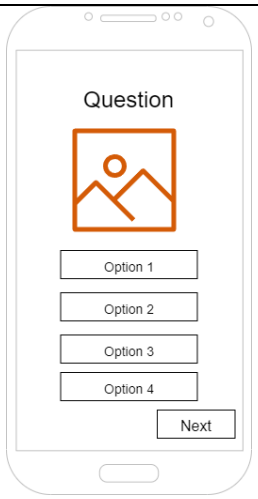
1. This is the puzzle page scene for this application. 2. The puzzle will put image button. 3. User can select the image button go to play puzzle page

FRAME 16	SCENE: Play Puzzle Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Image Button
Sound	-
Music	-
Previous Scene	Puzzle Page
Remarks	

1. This is the play puzzle page scene for this application. 2. User can move the puzzle piece to the frame.

FRAME 17	SCENE: Quiz Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Animal Image Button, Ball Image Button, Food Image Button, Fruit Image Button, Home Image Button, Playground Image Button, School Image Button, Tool Image Button, Vegetable Image Button, and Vehicle Image Button
Sound	-
Music	-
Previous Scene	Play Page

Remarks
1. This is the quiz page scene for this application. 2. The quiz page will put ten category image buttons. 3. User can select the category go to play quiz game.

FRAME 18	SCENE: Play Quiz Page
	
Interface	
Interface	2D
Texts	Helvetica
Button	Option Button, Next Button
Sound	-
Music	-
Previous Scene	Quiz Page

Remarks
1. This is the play quiz page scene for this application. 2. The quiz page will put four option buttons and one next button. 3. User can select the option button and click the next button if finish select the option.

3.13 Testing Plan

This part is showing the planning how to design the User Acceptance Test (UAT) form according to the requirement of the system.

No.	Module	Activities	Status				Comments
1	Main Page	Select Learn	Yes		No		
		Select Play	Yes		No		
2	Learn Page	Select Animal	Yes		No		
		Select Ball	Yes		No		
		Select Food	Yes		No		
		Select Fruit	Yes		No		
		Select Home	Yes		No		

		Select Playground	Yes		No		
		Select School	Yes		No		
		Select Tool	Yes		No		
		Select Vegetable	Yes		No		
		Select Vehicle	Yes		No		
3	Animal Page	Select Ant and see the AR object	Yes		No		
		Select Bat and see the AR object	Yes		No		
		Select Bear and see the AR object	Yes		No		
		Select Bee and see the AR object	Yes		No		
		Select Butterfly and see the AR object	Yes		No		

		Select Cat and see the AR object	Yes		No		
		Select Crocodile and see the AR object	Yes		No		
		Select Duck and see the AR object	Yes		No		
		Select Dog and see the AR object	Yes		No		
		Select Elephant and see the AR object	Yes		No		
		Select Fox and see the AR object	Yes		No		
		Select Fish and see the AR object	Yes		No		
		Select Goat and see the AR object	Yes		No		
		Select Gorilla and	Yes		No		

		see the AR object					
		Select Giraffe and see the AR object	Yes		No		
		Select Horse and see the AR object	Yes		No		
		Select Kangaroo and see the AR object	Yes		No		
		Select Kiwi and see the AR object	Yes		No		
		Select Lion and see the AR object	Yes		No		
		Select Monkey and see the AR object	Yes		No		
		Select Mouse and see the AR object	Yes		No		

		Select Octopus and see the AR Object	Yes		No		
		Select Panda and see the AR Object	Yes		No		
		Select Penguin and see the AR Object	Yes		No		
		Select Rabbit and see the AR Object	Yes		No		
		Select Rhino and see the AR Object	Yes		No		
		Select Scorpion and see the AR Object	Yes		No		
		Select Spider and see the AR Object	Yes		No		

		Select Snake and see the AR Object	Yes		No		
		Select Tiger and see the AR Object	Yes		No		
		Select Turtle and see the AR Object	Yes		No		
		Select Whale and see the AR Object	Yes		No		
		Select Wolf and see the AR Object	Yes		No		
		Select Zebra and see the AR Object	Yes		No		
4	Ball Page	Select Basketball and see the AR Object	Yes		No		

		Select Baseball and see the AR Object	Yes		No		
		Select Bowling and see the AR Object	Yes		No		
		Select Cricket and see the AR Object	Yes		No		
		Select Football and see the AR Object	Yes		No		
		Select Golf and see the AR Object	Yes		No		
		Select Rugby and see the AR Object	Yes		No		
		Select Ping Pong and see the AR Object	Yes		No		

		Select Pool and see the AR Object	Yes		No		
		Select Shuttlecock and see the AR Object	Yes		No		
		Select Volleyball and see the AR Object	Yes		No		
		Select Tennis and see the AR Object	Yes		No		
5	Food Page	Select Bacon and see the AR Object	Yes		No		
		Select Bread and see the AR Object	Yes		No		
		Select Butter and see the AR Object	Yes		No		

		Select Cake and see the AR Object	Yes		No		
		Select Cheese and see the AR Object	Yes		No		
		Select Donut and see the AR Object	Yes		No		
		Select Egg and see the AR Object	Yes		No		
		Select French Fries and see the AR Object	Yes		No		
		Select Ham and see the AR Object	Yes		No		
		Select Hamburger and see the AR Object	Yes		No		

		Select Hot Dog and see the AR Object	Yes		No		
		Select Ice Cream and see the AR Object	Yes		No		
		Select Pie and see the AR Object	Yes		No		
		Select Pizza and see the AR Object	Yes		No		
		Select Roast Chicken and see the AR Object	Yes		No		
		Select Kebab and see the AR Object	Yes		No		
		Select Salad and see the AR Object	Yes		No		

		Select Sandwich and see the AR Object	Yes		No		
		Select Steak and see the AR Object	Yes		No		
		Select Waffle and see the AR Object	Yes		No		
6	Fruit Page	Select Apple and see the AR Object	Yes		No		
		Select Avocado and see the AR Object	Yes		No		
		Select Banana and see the AR Object	Yes		No		
		Select Blueberry and see the AR Object	Yes		No		

		Select Cherry and see the AR Object	Yes		No		
		Select Coconut and see the AR Object	Yes		No		
		Select Dragon Fruit and see the AR Object	Yes		No		
		Select Fig and see the AR Object	Yes		No		
		Select Grape and see the AR Object	Yes		No		
		Select Kiwi and see the AR Object	Yes		No		
		Select Lemon and see the AR Object	Yes		No		
		Select Lime and see	Yes		No		

		the AR Object					
		Select Lychee and see the AR Object	Yes		No		
		Select Mango and see the AR Object	Yes		No		
		Select Melon and see the AR Object	Yes		No		
		Select Orange and see the AR Object	Yes		No		
		Select Papaya and see the AR Object	Yes		No		
		Select Peach and see the AR Object	Yes		No		
		Select Pear and see	Yes		No		

		the AR Object					
		Select Pineapple and see the AR Object	Yes		No		
		Select Strawberry and see the AR Object	Yes		No		
		Select Watermelon and see the AR Object	Yes		No		
7	Home Page	Select Armchair and see the AR Object	Yes		No		
		Select Bookcase and see the AR Object	Yes		No		
		Select Broom and see the AR Object	Yes		No		
		Select Carpet and	Yes		No		

		see the AR Object					
		Select Chandelier and see the AR Object	Yes		No		
		Select Door and see the AR Object	Yes		No		
		Select Fork and see the AR Object	Yes		No		
		Select Fridge and see the AR Object	Yes		No		
		Select Glass and see the AR Object	Yes		No		
		Select Guitar and see the AR Object	Yes		No		
		Select Hair Dryer	Yes		No		

		and see the AR Object					
		Select Hanger and see the AR Object	Yes		No		
		Select Kettle and see the AR Object	Yes		No		
		Select Lamp and see the AR Object	Yes		No		
		Select Microwave and see the AR Object	Yes		No		
		Select Piano and see the AR Object	Yes		No		
		Select Rice Cooker and see the AR Object	Yes		No		
		Select Sofa and see	Yes		No		

		the AR Object					
		Select Spoon and see the AR Object	Yes		No		
		Select Television and see the AR Object	Yes		No		
		Select Toaster and see the AR Object	Yes		No		
		Select Vacuum and see the AR Object	Yes		No		
8	Playground Page	Select Bench and see the AR Object	Yes		No		
		Select Carousel and see the AR Object	Yes		No		
		Select Climbing Frame and	Yes		No		

		see the AR Object					
		Select Monkey Bar and see the AR Object	Yes		No		
		Select Picnic Table and see the AR Object	Yes		No		
		Select Rocking Horse and see the AR Object	Yes		No		
		Select Seesaw and see the AR Object	Yes		No		
		Select Slide and see the AR Object	Yes		No		
		Select Swing and see the AR Object	Yes		No		
		Select Spring Rider	Yes		No		

		and see the AR Object					
		Select Sandpit and see the AR Object	Yes		No		
		Select Trampoline and see the AR Object	Yes		No		
9	School Page	Select Bag and see the AR Object	Yes		No		
		Select Black Board and see the AR Object	Yes		No		
		Select Book and see the AR Object	Yes		No		
		Select Calculator and see the AR Object	Yes		No		
		Select Chalk and see	Yes		No		

		the AR Object					
		Select Crayon and see the AR Object	Yes		No		
		Select Desk and see the AR Object	Yes		No		
		Select Eraser and see the AR Object	Yes		No		
		Select Folder and see the AR Object	Yes		No		
		Select Globe and see the AR Object	Yes		No		
		Select Highlighter and see the AR Object	Yes		No		
		Select Paper and see	Yes		No		

		the AR Object					
		Select Pen and see the AR Object	Yes		No		
		Select Pencil and see the AR Object	Yes		No		
		Select Pencil Case and see the AR Object	Yes		No		
		Select Ruler and see the AR Object	Yes		No		
		Select Sharpener and see the AR Object	Yes		No		
		Select White Board and see the AR Object	Yes		No		
10	Tool Page	Select Allen Key and see the	Yes		No		

		AR Object View User Profile					
		Select Axe and see the AR Object	Yes		No		
		Select Chisel and see the AR Object	Yes		No		
		Select Clamp and see the AR Object	Yes		No		
		Select Electric Drill and see the AR Object	Yes		No		
		Select File and see the AR Object	Yes		No		
		Select Fork and see the AR Object	Yes		No		
		Select Hammer and	Yes		No		

		see the AR Object					
		Select Mallet and see the AR Object	Yes		No		
		Select Pocket Knife and see the AR Object	Yes		No		
		Select Pliers and see the AR Object	Yes		No		
		Select Saw and see the AR Object	Yes		No		
		Select Screwdriver and see the AR Object	Yes		No		
		Select Scissor and see the AR Object	Yes		No		
		Select Spanner and	Yes		No		

		see the AR Object					
		Select Wrench and see the AR Object	Yes		No		
11	Vegetable Page	Select Artichoke and see the AR Object	Yes		No		
		Select Beet and see the AR Object	Yes		No		
		Select Bell Pepper and see the AR Object	Yes		No		
		Select Broccoli and see the AR Object	Yes		No		
		Select Cabbage and see the AR Object	Yes		No		
		Select Carrot and	Yes		No		

		see the AR Object					
		Select Carrot and see the AR Object	Yes		No		
		Select Corn and see the AR Object	Yes		No		
		Select Cauliflower and see the AR Object	Yes		No		
		Select Cucumber and see the AR Object	Yes		No		
		Select Mushroom and see the AR Object	Yes		No		
		Select Onion and see the AR Object	Yes		No		
		Select Potato and	Yes		No		

		see the AR Object					
		Select Pumpkin and see the AR Object	Yes		No		
		Select Radish and see the AR Object	Yes		No		
		Select Sweet Potato and see the AR Object	Yes		No		
		Select Tomato and see the AR Object	Yes		No		
12	Vehicle Page	Select Aeroplane and see the AR Object	Yes		No		
		Select Bicycle and see the AR Object	Yes		No		
		Select Boat and see	Yes		No		

		the AR Object					
		Select Bus and see the AR Object	Yes		No		
		Select Car and see the AR Object	Yes		No		
		Select Scooter and see the AR Object	Yes		No		
		Select Ship and see the AR Object	Yes		No		
		Select Train and see the AR Object	Yes		No		
		Select Truck and see the AR Object	Yes		No		
		Select Helicopter	Yes		No		

		and see the AR Object					
		Select Motorcycle and see the AR Object	Yes		No		
		Select Ambulance and see the AR Object	Yes		No		
		Select Van and see the AR Object	Yes		No		
		Select Fire Engine and see the AR Object	Yes		No		
		Select Forklift and see the AR Object	Yes		No		
		Select Race Car and see the AR Object	Yes		No		
13	Play Page	Select Puzzle	Yes		No		

		Select Quiz	Yes		No		
14	Puzzle Page	Select puzzle picture and play puzzle	Yes		No		
15	Quiz Page	Select Animal and play quiz	Yes		No		
		Select Ball and play quiz	Yes		No		
		Select Food and play quiz	Yes		No		
		Select Fruit and play quiz	Yes		No		
		Select Home and play quiz	Yes		No		
		Select Playground and play quiz	Yes		No		
		Select School and play quiz	Yes		No		

		Select Tool and play quiz	Yes		No		
		Select Vegetable and play quiz	Yes		No		
		Select Vehicle and play quiz	Yes		No		

Table 3.7: Testing Plan of Kid Learn mobile application

This test has been performed by:

Name:

Signature:

Date:

3.14 Hardware & Software Specification

a. Hardware Requirements

Hardware	Specification	Purpose
Acer Nitro AN515-52	• Windows 10 Home Single Language • Intel Core i5-8300H CPU 2.30GHz • 20.0 GB RAM • 64-bit Operating System • X64-based processor	Used in the creation of documents and the development of mobile applications.
Android Smartphone	• POCO F3	Used the real emulator to test run the application.

	• Android 12, MIUI 13.0.3.0 for POCO • Qualcomm SM8250-AC Snapdragon 870 5G (7 nm) • Li-Po 4520 mAh • 256GB storage • 8GB RAM • 1080 x 2400 pixels	

Table 3.8: Hardware Specification

b. Software Requirement

Software	Purpose
Android Studio	Use to develop mobile application and for Java coding.
Firebase	Used as a database to store information and data.
Draw .io	Used to draw the flowchart, use case diagram and design user interfaces.
Microsoft Word 365	Used to prepare the documents.
Microsoft Excel	Used to draw the Gantt Chart.
Google Chrome	Used to search for the resources.

Table 3.9: Software Specification

3.15 Gantt Chart

A Gantt Chart is a development tool that represents the project timeline graphically. It represents the beginning and ending periods of specific project tasks. The Gantt Chart of this project is prepared in Appendix A.

3.16 Conclusion

Finally, this chapter has thoroughly discussed the methodology used in project development. The detailed explanation includes all the flowcharts, use case diagrams, context diagrams, ERD diagrams, and interface design.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the result and discussion of the Kid Learn mobile application are presented with reference to the objectives that were started in Chapter 1. The implementation is presented with screenshots of the working prototype, and the functionality for each interface will be discussed throughout this chapter. Besides, the results and discussion will discuss the testing results of the project. Lastly, the summary will conclude all the contents of this chapter.

The Kid Learn mobile application is developed using Android Studio and Firebase as the real-time database. This application is designed for kid over the age of four, as well as their parents and teachers. In this application, kid can see the AR object to learn some words, and they can also play puzzles and quizzes. This application for parents and teachers is one of the teaching materials made available to them, making it simple for them to explain the meaning of some words.

4.2 System Design and Implementation

In this section, the Kid Learn mobile application will explain the steps in developing and implementing various features of the project. Each module of the project will be described briefly with screenshots of the interface in this section. Kid Learn mobile applications are developed in Android Studio and use an online database such as Google Firebase to store the AR objects.

4.2.1 Main Page

Figure 4.2.1: Main Page

The figure above shows the main page of the application. There are two buttons on the main page: Learn and Play. The user can click the “Learn” button to proceed to the Learn Page or click the “Play” button to proceed to the “Play Page”.

4.2.2 Learn Page

Figure 4.2.2: Learn Page

The figure above depicts what happens after users click the “Learn” button and navigate to the Learn Page. On this page, the user can select any of the following categories: Animal Button, Ball Button, Food Button, Fruit Button, Home Button, and Playground Button. Click the School, Tool, Vegetable, and Vehicle buttons to navigate to the desired page. Users, for example, will be directed to the Animals Learn Page if

they click the “Animals” button. The other category had the same action; go to a specific page.

4.2.3 Animal Learn Page

Figure 4.2.3: Animal Learn Page

The figure above depicts what happens after the user clicks the animal button and navigates to the animal learn page. This page contains 34 different types of animals for the user to choose from: Ant Button, Bear Button, Butterfly Button, Cat Button, Crocodile Button, Duck Button, Dog Button, Elephant Button, Fox Button, Fish Button, Goat Button, Gorilla Button, Giraffe Button, Horse Button, Kangaroo Button, Kiwi Button, Lion Button, Monkey Button, Mouse Button, Octopus Button, Panda Button, Penguin The user can click any type of animal button to proceed to the animal AR page. In the AR Page, users can see the Animal AR object on their phone.

4.2.4 Ball Learn Page

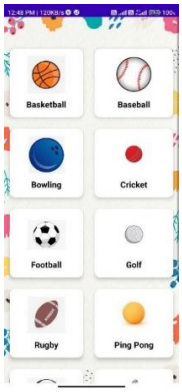


Figure 4.2.4: Ball Learn Page

The figure above depicts what occurred after the user clicked the ball button and navigated to the ball page. The user can click any type of ball that is prepared, which are the basketball button, baseball button, bowling button, cricket button, football button, golf button, rugby button, ping pong button, pool button, shuttlecock button, volleyball button, and tennis button, and proceed to the AR page. In the AR Page, users can see the Ball AR object on their phones.

4.2.5 Food Learn Page

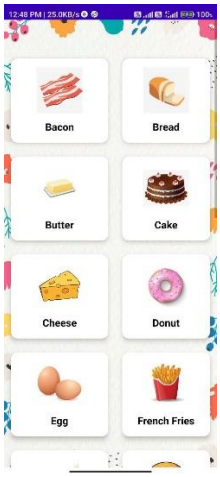


Figure 4.2.5: Food Learn Page

The figure above depicts what happens after a user clicks the food button and navigates to the food learning page. The user can click any type of food that is prepared, which are Bacon Button, Bread Button, Butter Button, Cake Button, Cheese Button, Donut Button, Egg Button, French Fries Button, Ham Button, Hamburger Button, Hot Dog Button, Ice Cream Button, Pie Button, Pizza Button, Roast Chicken Button, Kebab Button, Salad Button, Sandwich Button, Steak Button, and Waffle Button, and proceed to the AR Page. In the AR Page, users can see the Food AR object on their phone.

4.2.6 Fruit Learn Page

Figure 4.2.6: Fruit Learn Page

The figure above depicts what occurs after a user clicks the fruit button and navigates to the fruit learning page. The user can click any type of fruit that is prepared, which are the Apple button, Avocado button, Banana button, Blueberry button, Cherry button, Coconut button, Dragon fruit button, Fig button, Grape button, Kiwi button, Lemon button, Lime button, Lychee button, Mango button, Melon button, Orange button, Papaya button, Peach button, Pear button, Pineapple button, Strawberry button, and Watermelon button, and proceed to the AR page. In the AR Page, users can see the Fruit AR object on their phone.

4.2.7 Home Learn Page

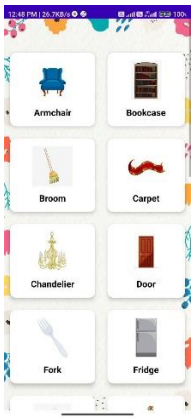


Figure 4.2.7: Home Learn Page

The figure above depicts what occurred after the user clicked the home button and navigated to the home page. The user can click any type of home element that is prepared,

which are: armchair button, bookcase button, broom button, carpet button, chandelier button, door button, fork button, fridge button, glass button, guitar button, hair dryer button, Hager button, kettle button, lamp button, microwave button, piano button, rice cooker button, sofa button, spoon button, television button, toaster button, and vacuum button. Click any of these to proceed to the AR Page. In the AR Page, users can see the Home AR object on their phones.

4.2.8 Playground Learn Page

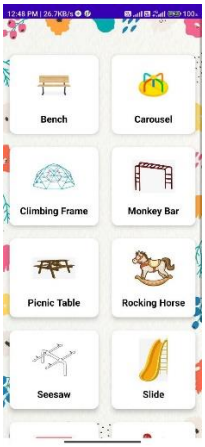


Figure 4.2.8: Playground Learn Page

The figure above depicts what occurs after a user clicks the Playground Button and navigates to the Playground Learn Page. The user can click any type of playground element that is prepared, which are the Bench Button, Carousel Button, Climbing Frame Button, Monkey Bar Button, Picnic Table Button, Rocking Horse Button, Seesaw Button, Slide Button, Swing Button, Spring Rider Button, Sandpit Button, and Trampoline Button, and proceed to the AR Page. In the AR Page, users can see the Playground AR object on their phone.

4.2.9 School Learn Page

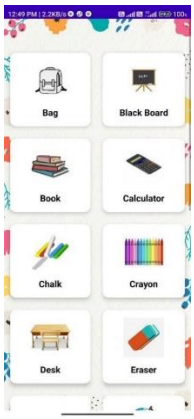


Figure 4.2.9: School Learn Page

The figure above depicts what occurs after the user clicks the school button and navigates to the school page. The user can proceed to the AR page by clicking any of the following school elements: bag button, black board button, book button, calculator button, chalk button, crayon button, desk button, eraser button, folder button, globe button, highlighter button, paper button, pencil button, pencil case button, ruler button, sharpener button, white board button. In the AR Page, users can see the "School" AR object on their phones.

4.2.10 Tool Learn Page

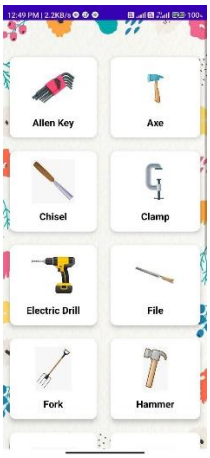


Figure 4.2.10: Tool Learn Page

The figure above depicts what occurs after the user clicks the tool button and navigates to the tool learn page. The user can click any type of tool that is prepared, which

are: Allen Key Button, Axe Button, Chisel Button, Clamp Button, Electric Drill Button, File Button, Fork Button, Hammer Button, Mallet Button, Pocket Knife Button, Pliers Button, Saw Button, Screwdriver Button, Scissor Button, Spanner Button, and Wrench Button. Proceed to the AR Page. In the AR Page, users can see the Tool AR object on their phones.

4.2.11 Vegetable Learn Page

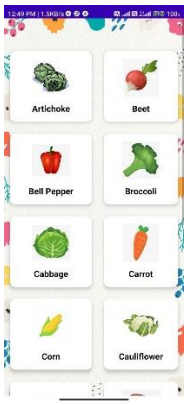


Figure 4.2.11: Vegetable Learn Page

The figure above depicts what occurs after a user clicks the vegetable button and navigates to the vegetable learn page. The user can click any type of vegetable that is prepared, which are: artichoke button, beet button, bell pepper button, broccoli button, cabbage button, carrot button, corn button, cauliflower button, cucumber button, mushroom button, onion button, potato button, pumpkin button, radish button, sweet potato button, and tomato button, and proceed to the AR page. Users can see the Vegetable AR object on their phone by visiting the AR Page.

4.2.12 Vehicle Learn Page

Figure 4.2.12: Vehicle Learn Page

The figure above depicts what occurs after the user clicks the tool button and navigates to the tool learn page. The user can click any type of tool that is prepared, which are the aeroplane button, bicycle button, boat button, bus button, car button, scooter button, train button, helicopter button, motorcycle button, ambulance button, van button, fire engine button, forklift button, and race car button, and proceed to the AR page. In the AR Page, users can see the Vehicle AR object on their phones.

4.2.13 AR Page

Figure 4.2.13: AR Page

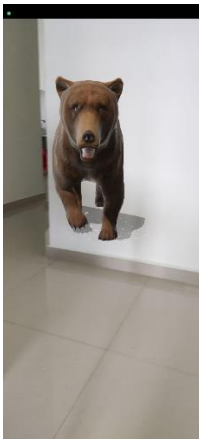


Figure 4.2.14: AR Object

The two figures above show that after the user clicks the category in the learn page and clicks the element inside the category, the user will proceed to the AR page. The AR Page will open the user's phone camera and instruct the user on how to scan the floor. The user needs to scan the floor until the white dots come out, and then click the white dot area. After clicking the white dot area, the AR object will be displayed. Depending on the user's selection, the AR Object will have a different display.

4.2.14 Play Page

Figure 4.2.15: Play Page

The figure above depicts the user's journey to the play page after clicking the play button. This application includes two games: a puzzle game and a quiz game. To navigate to a specific page, the user can use the Puzzle Button or the Quiz Button.

4.2.15 Puzzle Page

Figure 4.2.16: Puzzle Page

The figure above depicts what occurs after users click the puzzle button on the play page and navigate to the puzzle page. We have prepared 100 different types of puzzle pictures for the user to choose from and play with on the Puzzle Page. The user can choose any type of puzzle picture and then proceed to the Play Puzzle Page to begin playing the puzzle game.

4.2.16 Play Puzzle Page

Figure 4.2.17: Play Puzzle Page

The figure depicts what happens after the user selects the puzzle image on the Puzzle Page and navigates to the Play Puzzle Game Page. The user can move the puzzle piece and place it inside the frame on this page. When the user places the correct puzzle piece in the correct location, the puzzle pieces fix and the user is unable to move the puzzle again. If a puzzle piece is placed incorrectly, the puzzle can still move until it is placed correctly. After the user finishes the puzzle game, he will proceed back to the

puzzle page. The user can choose another puzzle picture to continue playing the puzzle game.

4.2.17 Quiz Page

Figure 4.2.18: Quiz Page

The figure above depicts what occurred after the user clicked the quiz button on the Play Page and went to the Quiz Page. We have prepared ten categories for users to play the quiz in on the quiz page. The user can select any category quiz, and the user will proceed to the Play Quiz Page and start to do the quiz.

4.2.18 Play Quiz Page

Figure 4.2.19: Play Quiz Page

The figure above depicts what happens after the user chooses a category quiz and begins playing the quiz game. On this page, users have 20 seconds to choose the correct answer. After completing the first quiz, the user can proceed to the next quiz question by

clicking the Next button. After the user finishes the quiz, they will proceed back to the quiz page and choose another category of quiz.

4.3 System Testing

User acceptance testing and unit testing have both been performed on the Kid Learn mobile application. Unit testing, a type of software testing, evaluates specific units or projects. Unit testing is used to make sure that every piece of software code works in the correct manner. A checklist is made when running unit testing to make sure that no features are overlooked. The Main Page, the Learn Page, the Animal Learn Page, the Ball Learn Page, the Food Learn Page, the Fruit Learn Page, the Home Learn Page, the Playground Learn Page, the School Learn Page, the Tool Learn Page, the Vegetable Learn Page, the Vehicle Learn Page, the AR Page, the Play Page, the Puzzle Page, the Play Puzzle Page, the Quiz Page, and the Play Quiz Page are fourteen components of a unit test. The buttons on each element are examined separately. The "Success" column is tested to see if the components function as planned. If the components do not function as expected, the "Failed" column is indicated. A comment is needed if the functions don't run as expected. Below the table is a display of the unit testing results.

No.	Test Case	Success	Failed	Remark
1.	Main Page • Learn Button • Play Button	 √ √		
2.	Learn Page • Animal Image Button • Ball Image Button • Food Image Button • Fruit Image Button • Home Image Button	 √ √ √ √ √		

	• Playground Image Button • School Image Button • Tool Image Button • Vegetable Image Button • Vehicle Image Button	√ √ √ √ √		
3.	Animal Learn Page • Ant Image Button • Bat Image Button • Bear Image Button • Bee Image Button • Butterfly Image Button • Cat Image Button • Crocodile Image Button • Duck Image Button • Dog Image Button • Elephant Image Button • Fox Image Button	 √ √ √ √ √ √ √ √ √ √ √		

	• Fish Image Button	√		
	• Goat Image Button	√		
	• Gorilla Image Button	√		
	• Giraffe Image Button	√		
	• Horse Image Button	√		
	• Kangaroo Image Button	√		
	• Kiwi Image Button	√		
	• Lion Image Button	√		
	• Monkey Image Button	√		
	• Mouse Image Button	√		
	• Octopus Image Button	√		
	• Panda Image Button	√		
	• Penguin Image Button	√		
	• Rabbit Image Button	√		
	• Rhino Image Button	√		
	• Scorpion Image Button	√		
	• Spider Image Button	√		

	• Snake Image Button • Tiger Image Button • Turtle Image Button • Whale Image Button • Wolf Image Button • Zebra Image Button	√ √ √ √ √ √		
4.	Ball Learn Page • Basketball Image Button • Baseball Image Button • Bowling Image Button • Cricket Image Button • Football Image Button • Golf Image Button • Rugby Image Button • Ping Pong Image Button • Pool Image Button • Shuttlecock Image Button	 √ √ √ √ √ √ √ √ √ √		

	• Volleyball Image Button • Tennis Image Button	√ √		
5.	Food Learn Page • Bacon Image Button • Bread Image Button • Butter Image Button • Cake Image Button • Cheese Image Button • Donut Image Button • Egg Image Button • Frech Fries Image Button • Ham Image Button • Hamburger Image Button • Hot Dog Image Button • Ice Cream Image Button • Pie Image Button • Pizza Image Button	 √ √ √ √ √ √ √ √ √ √ √ √ √ √		

	• Roast Image Button • Kebab Image Button • Salad Image Button • Sandwich Image Button • Steak Image Button • Waffle Image Button	√ √ √ √ √ √		
6.	Fruit Learn Page • Apple Image Button • Avocado Image Button • Banana Image Button • Blueberry Image Button • Cherry Image Button • Coconut Image Button • Dragon Fruit Image Button • Fig Image Button • Grape Image Button • Kiwi Image Button	 √ √ √ √ √ √ √ √ √ √		

	• Lemon Image Button • Lime Image Button • Lychee Image Button • Mango Image Button • Melon Image Button • Orange Image Button • Papaya Image Button • Peach Image Button • Pear Image Button • Pineapple Image Button • Strawberry Image Button • Watermelon Image Button	√ √ √ √ √ √ √ √ √ √ √ √		
7.	Home Learn Page • Armchair Image Button • Bookcase Image Button • Broom Image Button • Carpet Image Button	 √ √ √ √		

	• Chandelier Image Button	√		
	• Door Image Button	√		
	• Fork Image Button	√		
	• Fridge Image Button	√		
	• Glass Image Button	√		
	• Guitar Image Button	√		
	• Hair Dryer Image Button	√		
	• Hanger Image Button	√		
	• Kettle Image Button	√		
	• Lamp Image Button	√		
	• Microwave Image Button	√		
	• Piano Image Button	√		
	• Rice Cooker Image Button	√		
	• Sofa Image Button	√		
	• Spoon Image Button	√		
	• Television Image Button	√		
	• Toaster Image Button	√		

	• Vacuum Image Button	√		
8.	Playground Learn Page • Bench Image Button • Carousel Image Button • Climbing Frame Image Button • Monkey Bar Image Button • Picnic Table Image Button • Rocking Horse Image Button • Seesaw Image Button • Slide Image Button • Swing Image Button • Spring Rider Image Button • Sandpit Image Button • Trampoline Image Button	 √ √ √ √ √ √ √ √ √ √ √		
9.	School Learn Page • Bag Image Button • Black Board Image Button	 √ √		

	• Book Image Button • Calculator Image Button • Chalk Image Button • Crayon Image Button • Desk Image Button • Eraser Image Button • Folder Image Button • Globe Image Button • Highlighter Image Button • Paper Image Button • Pen Image Button • Pencil Image Button • Pencil Case Image Button • Ruler Image Button • Sharpener Image Button • White Board Image Button	√ √ √ √ √ √ √ √ √ √ √ √ √ √ √ √		
10.	Tool Learn Page			

	• Allen Key Image Button	√		
	• Axe Image Button	√		
	• Chisel Image Button	√		
	• Clamp Image Button	√		
	• Electric Drill Image Button	√		
	• File Image Button	√		
	• Fork Image Button	√		
	• Hammer Image Button	√		
	• Mallet Image Button	√		
	• Pocket Knife Image Button	√		
	• Pliers Image Button	√		
	• Saw Image Button	√		
	• Screwdriver Image Button	√		
	• Spanner Image Button	√		
	• Wrench Image Button	√		
11.	Vegetable Learn Page • Artichoke Image Button	√		

	• Beet Image Button	√		
	• Bell Pepper Image Button	√		
	• Broccoli Image Button	√		
	• Cabbage Image Button	√		
	• Carrot Image Button	√		
	• Corn Image Button	√		
	• Cauliflower Image Button	√		
	• Cucumber Image Button	√		
	• Mushroom Image Button	√		
	• Onion Image Button	√		
	• Potato Image Button	√		
	• Pumpkin Image Button	√		
	• Radish Image Button	√		
	• Sweet Potato Image Button	√		
	• Tomato Image Button	√		
12.	Vehicle Learn Page			
	• Aeroplane Image Button	√		

	• Bicycle Image Button • Boat Image Button • Bus Image Button • Car Image Button • Scooter Image Button • Ship Image Button • Train Image Button • Truck Image Button • Helicopter Image Button • Motorcycle Image Button • Ambulance Image Button • Vam Image Button • Fire Engine Image Button • Forklift Image Button • Race Car Image Button	√ √ √ √ √ √ √ √ √ √ √ √ √ √		
13.	AR Page • All AR Object	√		
14.	Play Page			

	• Puzzle Button • Quiz Button	√ √		
15.	Puzzle Page • All Puzzle Image Button	 √		
16.	Play Puzzle Page • All Puzzle Image • All Puzzle Piece	 √ √		
17.	Quiz Page • Animal Image Button • Ball Image Button • Food Image Button • Fruit Image Button • Home Image Button • Playground Image Button • School Image Button • Tool Image Button • Vegetable Image Button • Vehicle Image Button	 √ √ √ √ √ √ √ √ √ √		
18.	Play Quiz Page			

	• Four Option Button • All Quiz Timer • Next Button • All Quiz Image	√ √ √ √		

Table 4.1: Unit Testing Checklist

4.4 Results and Discussion

The last step in the software testing process is the user acceptance test, or UAT. Real software users test the application during UAT to ensure that it can complete specific tasks under real-world conditions and that it satisfies the requirements. One of the last and most important project stages that must be completed before the application is made available to the public is user acceptance testing (UAT). In this project, parents who will be the application's end users will conduct user acceptance testing using Google Form on behalf of the PTA. Below the figure are the results of the tests and the questions that were presented. Appendix B contained the results of the tests.

The findings of the user acceptance testing for this application, which involved 45 parents, are listed below.

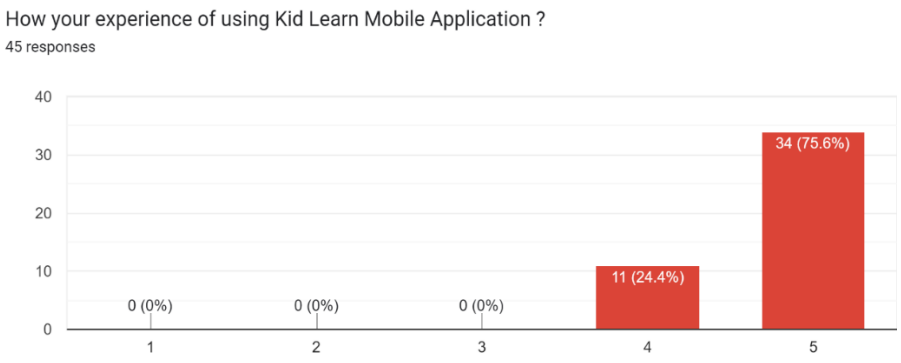


Figure 4.4.1: Result for question one

As the above figure shows, 75.6% of users rate the Kid Learn mobile application as very good, while 24.4% rate it as good. Overall, this application provides a good experience for the user.

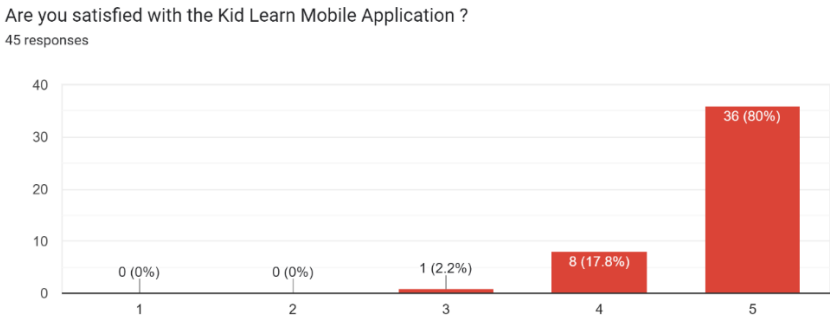


Figure 4.4.2: Result for question two

Users can rate the Kid Learn mobile application from 1 to 5, with 1 being very dissatisfied, 2 being dissatisfied, 3 being neutral, 4 being satisfied, and 5 being extremely satisfied. In question two, 80% of users are very satisfied with this application, 17.8% of users are satisfied with this application, and 2.2% of users feel normal in this application.

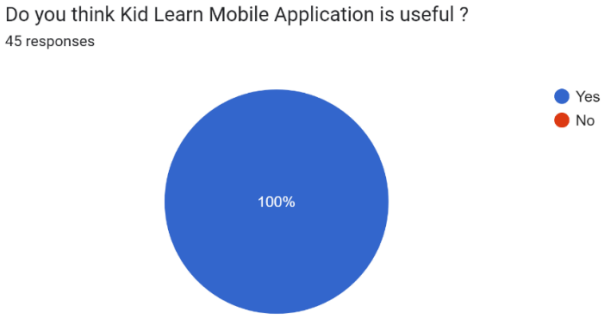


Figure 4.4.3: Result for question three

As the figure above shows, the user thinks the Kid Learn mobile application is useful for them.

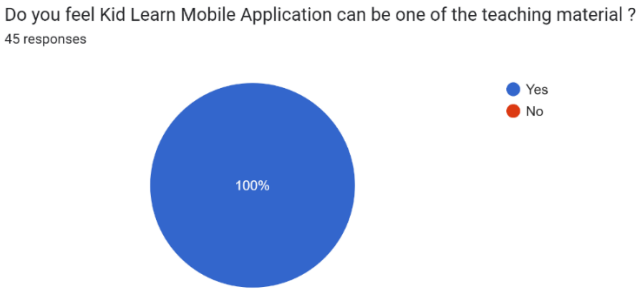


Figure 4.4.4: Result for question four

In question four, the user says they feel the Kid Learn mobile application can be one of the teaching materials for them.

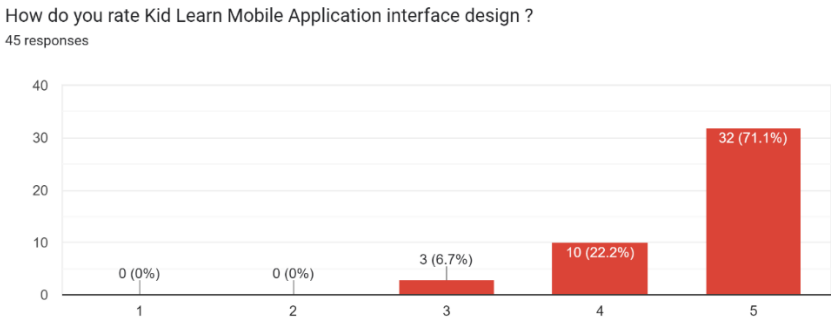


Figure 4.4.5: Result for question five

In question five, the user may rate 1 through 5. Rate 1 is very poor, rate 2 is poor, rate 3 is neutral, rate 4 is good, and rate 5 is very good. According to the graph above, 71.1% of users rate the Kid Learn mobile application interface design as very good, 22.2% rate it good, and 6.7% rate it neutrally.

4.5 Summary

In this chapter, the effects of each page or function are covered in detail. This chapter illustrates the project's outcome, or result. The result includes a screenshot of a mobile application that is entirely operational. A full explanation is provided for each page and function. Following that, the outcome is discussed.

CHAPTER 5

CONCLUSION

5.1 Introduction

The system's final objective is to create a kid-friendly mobile application. The objective is to get kids interested in learning. Many different types of learning applications are currently available on the market, but they rarely use the AR technique. To train their memory, children can use this application to learn the word with the AR technique, play the puzzle game, and take the quiz. This application was developed with Android Studio and the Java programming language. This application includes three functions for kids and one function for administrators.

Additionally, depending on the outcomes of the previous chapters, this mobile application has succeeded in its objective (Chapter 4: Results and Discuss). It follows that this application is clearly helpful to the child. User Acceptance Testing is performed on all application buttons and features. The function required to satisfy user demands and accomplish the program's objective, it helps with the evaluation of the complete application.

5.2 Limitation

One of the limitations that can be found in this project is that the Kid Learn mobile application only supports Android users; iOS users are not supported. This is because the Android Studio can only develop Android applications.

Aside from that, the user must have a reliable internet connection. This is due to the fact that the AR object requires a strong internet connection to display. If the internet speed is slow, the AR object will be slow to display on the mobile screen.

In addition, the AR function only supports the latest Android mobile phones, which are Android versions 11 (Red Velvet Cake) and 12 (Snow Cone). If using the old Android version, the user will fail to open the AR function. This is because the Google AR Core only supports the latest Android version.

Furthermore, the AR model's display is too monotonous. The AR model cannot display different models at the same time. If the user needs to select another AR model, the user must proceed back to the learn page and select another category to see another AR model.

Moreover, the update functions in this application are not good. For example, if the developer adds a new function or updates the application, the user must uninstall the old version before installing the new version.

5.3 Future Work

This application still needs to be enhanced and improved in some areas. This application can be developed using application frameworks such as Flutter. This is because Flutter can support the Android and iOS operating systems. iOS users have increased dramatically in recent years; the iOS platform should be developed to ensure both platforms' users can utilise this application. Besides that, this application can still enhance the AR object, quiz game, and puzzle game to become more innovative. Because learning materials are becoming more innovative, this application may attract more users. Furthermore, the AR object in this application can be designed with a small file size. Because the file size is small, the AR object display time will be fast on the mobile phone screen, so the user experience will not be affected. Furthermore, this application can still improve the update function to ensure that the user experience is not harmed.

REFERENCES

Augmented Reality (AR) Definition. (2020, December 2). https://www.investopedia.com/terms/a/augmented-reality.asp

Benefits of Technology in the Classroom - TeachHUB. (2019, November 7). https://www.teachhub.com/technology-in-the-classroom/2019/11/benefits-of-technology-in-the-classroom/

Definition and Examples of Vocabulary. (2019, November 3). https://www.thoughtco.com/vocabulary-definition-1692597

Entity Relationship Diagram (ERD) - What is an ER Diagram? (2006, November 8). https://www.smartdraw.com/entity-relationship-diagram/

Impact of Technology on Kids Today and Tomorrow. (2019, October 3). https://www.wgu.edu/blog/impact-technology-kids-today-tomorrow1910.html#close

The Benefits of Adhering to a Software Development Methodology. (2015, August 7). https://www.seguetech.com/benefits-adhering-software-development-methodology-concepts/

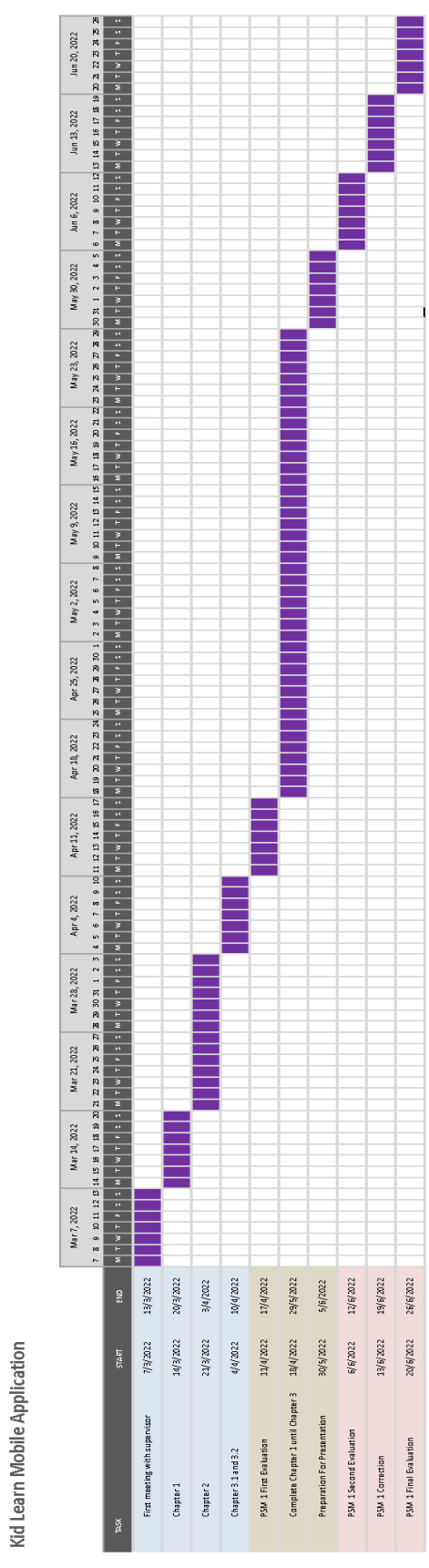
Top 4 software development methodologies | Synopsys. (2017, March 28). https://www.synopsys.com/blogs/software-security/top-4-software-development-methodologies/

UML Use Case Diagram: Tutorial with EXAMPLE. (2022, April 23). https://www.guru99.com/use-case-diagrams-example.html

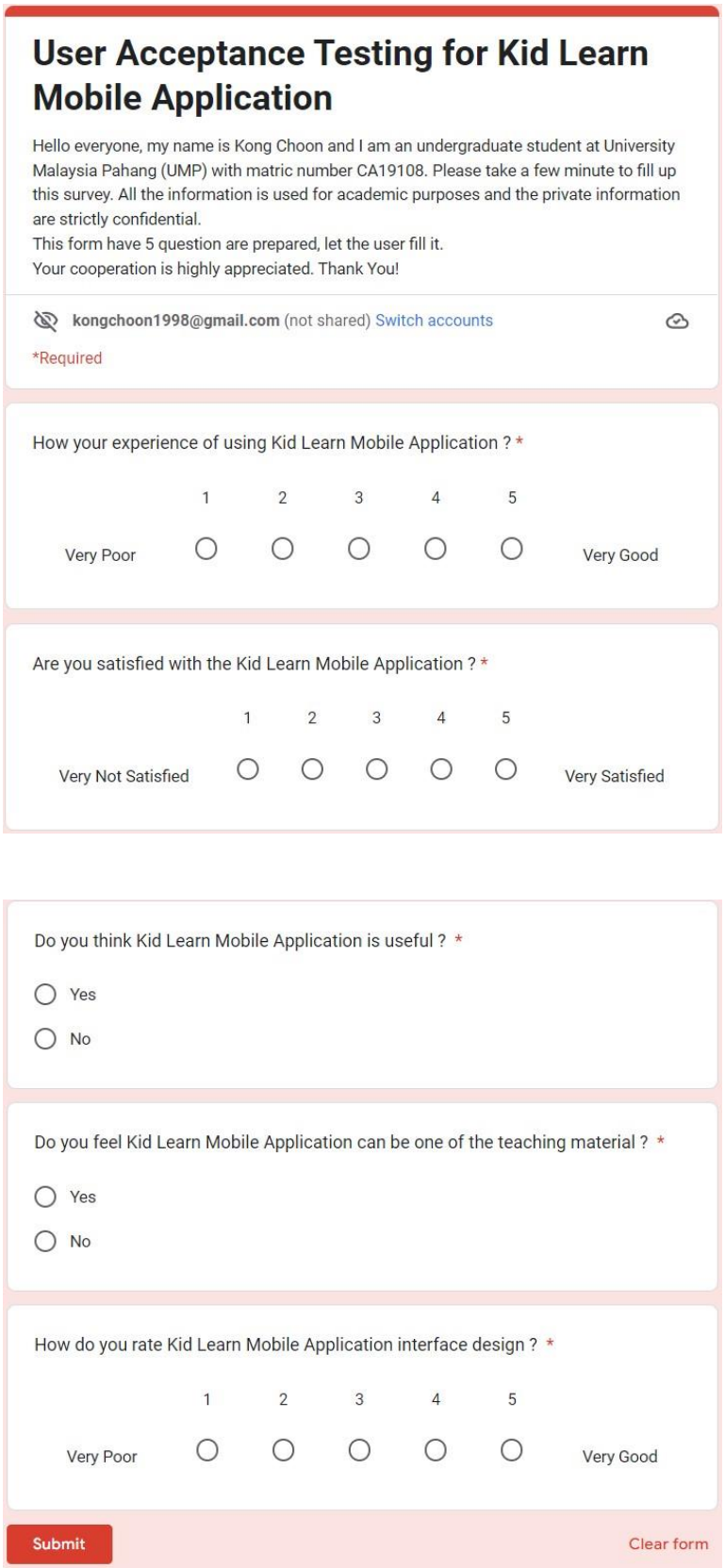
What is a Context Diagram (and How Can You Create One)? - Venngage. (2022, April 6). https://venngage.com/blog/context-diagram/

What is a Flowchart? Symbols, Types, and How To Read it • Asana. (2021, October 7). https://asana.com/resources/what-is-a-flowchart

APPENDIX A
GANTT CHART



APPENDIX B
USER ACCEPTANCE TESTING



User Acceptance Testing for Kid Learn Mobile Application

Hello everyone, my name is Kong Choon and I am an undergraduate student at University Malaysia Pahang (UMP) with matric number CA19108. Please take a few minute to fill up this survey. All the information is used for academic purposes and the private information are strictly confidential.
This form have 5 question are prepared, let the user fill it.
Your cooperation is highly appreciated. Thank You!

kongchoon1998@gmail.com (not shared) Switch accounts

*Required

How your experience of using Kid Learn Mobile Application ? *

	1	2	3	4	5	
Very Poor	○	○	○	○	○	Very Good

Are you satisfied with the Kid Learn Mobile Application ? *

	1	2	3	4	5	
Very Not Satisfied	○	○	○	○	○	Very Satisfied

Do you think Kid Learn Mobile Application is useful ? *

○ Yes
○ No

Do you feel Kid Learn Mobile Application can be one of the teaching material ? *

○ Yes
○ No

How do you rate Kid Learn Mobile Application interface design ? *

	1	2	3	4	5	
Very Poor	○	○	○	○	○	Very Good

Submit Clear form